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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/035,672	11/01/2001	Shaoping Wang	P6244 (300842-008003)	4606

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EXAMINER

ANDERSON, MATTHEW A

ART UNIT

PAPER NUMBER

1765

DATE MAILED: 09/11/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/035,672

Applicant(s)

WANG ET AL.

Examiner

Matthew A. Anderson

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 June 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 and 30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-21 and 30 is/are rejected.
- 7) ☒ Claim(s) 2 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 November 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3. 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of group 1, claims 1-21, 30 in Paper No. 6 is acknowledged.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-7, 10-18, 20-21, 30 are rejected under 35 U.S.C. 102(b) as being anticipated by Schulze et al. (Near-equilibrium Growth of Micro-pipe-Free 6H-SiC Crystals by Near Physical Vapor Transport, Applied Physics Letters, Vol. 72, No. 13, pp. 1632-1634, March 30, 1998).

Schulze et al. disclose SiC single crystal growth using a temperature gradient measured from the seed (relatively low) temperature to the source (relatively high) temperature (see Fig. 1) in a graphite furnace. Near equilibrium indicates to the ordinary artisan a non-supper saturated environment. Initially the, temperatures are the same and the argon (an inert gas) is at 820 mbar (615 torr). The temperature of the seed is described as held constant throughout the process at about 2150°C. The

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temperature of the source is increased to about 2180°C. In page 1633, second column, last paragraph, it is disclosed that the no defect formation is observed when the source temperature is held constant at about 2180°C during the growth step with the reduction in argon pressure from 30 mbar (22.5 torr) to 5 mbar (3.75 torr). The maximum average growth rate during this constant temperature growth was 0.27 mm/h. The result was single poly-type 6H SiC with no micro-pipes or other defects.

The initial period when pressure is 820 mbar (P_0 for 1.5 hours) argon is described in column 2 on page 1632 as including lateral transport in which the seed surface is annealed and all surface defects on the seed are grown over and eliminated. The pressure is reduced to 30 mbar (P_1) and a thin 0.9 mm layer is then grown on the seed without benefit of a thermal gradient in approximately 4.5 hours. (Col. 1 top on page 1633.) The pressure was then reduced further to 5 mbar (P_2) to significantly increase the growth rate (col. 1 page 1633 end of first para. and col. 2 page 1633 bottom) without formation of micro-pipes for about 20 hours.

In respect to claims 4, 7, growth is stopped with a rapid increase in pressure as seen in Fig. 1 and a concurrent rapid temperature reduction.

In respect to claim 6, as seen in Fig. 1, P_0 is achieved before the seed temperature is obtained in the seed and source. P_0 is described as allowing only the lateral transport of material (see above). Step 1 of Fig. 1 describes the providing limitation of claim 6.

In respect to claim 20, Fig 4 shows nitrogen doping of the crystal from out-diffused gas introduced into the chamber during growth.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 8-9, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schulze et al. (Near-equilibrium Growth of Micro-pipe-Free 6H-SiC Crystals by Near Physical Vapor Transport, Applied Physics Letters, Vol. 72, No. 13, pp. 1632-1634, March 30, 1998) in view of Barrett et al (US 5,746,827).

Schulze et al. is described above.

Barrett et al. discloses a method of producing SiC crystals by the gradient method in a graphite furnace. The system is typically heated and evacuated prior to growth to remove any absorbed gases from the apparatus. (col. 5 lines 25-35).

Schulze does not describe as degas step prior to the preliminary growth step.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to combine the references because Barrett et al. describes the typical degas step in SiC growth processes and Schulze et al. discloses the effect of desorbed gases on the SiC product (see Schulze page 1634 second para.).

In respect to claim claims 8-9, 19, it would have been obvious to one of ordinary skill in the art at the time of the present invention to optimize the temperature and pressure of a degas step because such was suggested by both Schulze and Barrett and such optimization would have been achieved with only routine experimentation.

Claim Objections

6. Claim 2 is objected to because of the following informalities:

Both the notation P0 and P1 are used to indicate the pressure maintained in the system during the base growth step in claim 2(a) and 2(b). Appropriate correction is required.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew A. Anderson whose telephone number is (703) 308-0086. The examiner can normally be reached on M-Th, 6:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (703) 305-2667. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 872-9306 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

MAA
September 8, 2003

Matthew Anderson
A.U. 1765